

common entry 202 of the form fill system 200 to the match engine 500 which now gains program control.

[00071] Following carefully scripted rules of precedence, the match engine 500 now attempts to fill out the form. First, the match engine 500 passes the form to an automatic filler program 218 which calls upon a rules engine 220 to look up the form's web address in the dictionary database 1000, to locate any set of rules associated with that form's web address within the dictionary database 1000, and to use those rules to fill out the form. If a set of rules are found in the dictionary 1000 associated with this form's web address, then the form is filled out in accordance with those rules. Prior to returning the completed form to the user, the history unit 230 is contacted to check the history database to see if any user specific rules apply to this form. If the existing rules and/or history database provide a completed form then the match engine 500 returns the completed form over the paths 222 and 224 to the user's browser 108 or 114. The completed form is displayed to the user so that the user may verify its correctness and make any necessary or desired changes prior to final submission to the merchant. A copy of the completed form is also passed to the Temp Stg of Completed Forms 244 for later analysis.

[00072] If no entry is found for this particular form in the dictionary database 1000, then match engine 500 passes the blank form to the fuzzy logic 226. The fuzzy logic 226 extracts the field labels from the form as well as the field sizes and then compares this information for each entry field in the form to a variety of rules within the dictionary 1000 to come up with a statistical indication of which rule is the most likely to be the correct rule to govern the filling of that entry field of the form. The fuzzy logic 226 is designed to take into account variations in spelling as well as variations in field width when making this determination. If the fuzzy logic 226 is able to come up with a reasonably well matching rule for each entry field in the form, then it alters those rules, as needed, so that they precisely match the needs of this particular form, and then passes the rules to the automatic filler 218 which uses the rules, plus the rules engine 220, to fill out the form. Some of these rules will usually be newly-generated rules developed by the fuzzy logic system to match the field labels and sizes of the new form, while other of these rules may be existing rules that happen to match the form precisely. The fuzzy logic 226 places these rules into a temporary storage area 228 pending user review and possible revision of the entries made into the form in accordance with these rules. The automatic filler 218 places the completed form prepared using fuzzy logic 226 generated rules in Temp Stg of Completed Form 244 pending user review and possible revision of the entries made in the form. Then the fuzzy logic 226

returns the completed form to the match engine 500. Prior to returning the completed form to the user, the history unit 230 is contacted to check the history database to see if any user specific rules apply to this form. Following completion by fuzzy logic 226 and history unit 230, the form is returned over to paths 222 and 224 to the user's browser 108 or 114 for review and possible correction by the user prior to final submission to the merchant.

[00073] If the fuzzy logic 226 is unable to substantially match all of the entry fields in the form with likely rules, then the match engine 500 passes the form on to the history unit 230 which searches its history database 1200 to see if the same form has been encountered and filled out before by this user or by some other user. If so, then an exemplary form can be found and retrieved from the history database 1200 and filled in simply by retrieving user specific literal data from the wallet and placing it into the fields within the form labeled as indicated by the information 1202 found within the history database entry for that form, as was explained above. Then the form is returned by the match engine 500 over the paths 222 and 224 to the user's browser 108 or 114 for review and possible revision.

[00074] If this form and site have never been encountered before, and if no existing rules match the requirements necessary to complete any part of the form, then the fuzzy logic engine cannot complete any fields and the form and site has no entry in the history database 1200. In this case, then the match engine 500 simply transfers the blank form over the paths 222 and 224 to the user's browser 108 or 114 for completion by the user without any automated assistance.

THE FORM FILL SYSTEM—ADAPTING TO USER FEEDBACK

[00075] After a form has been checked over and possibly revised by the user with the browser 108 or 114, a completed form is returned over the path 232 to the form fill proxy 400, which passes it on over the path 234 to the vendor's web site 104 where the form is processed by the vendor in an appropriate manner. Further communication then occurs directly between the vendor's web site 104 and the user's browser 108 or 114 without further intervention by the form fill proxy 400. If the form is rejected or returned due to an error, the form fill process is repeated. If no changes can be identified, the form is returned to the user for manual modification.

[00076] The form fill proxy 400 also sends the user reviewed and revised form over the path 236 through the common entry 202 of the form fill system 200 to the completed form analysis engine 800. Since the user is no longer awaiting action from the form fill system 200, further analysis of the form and of the user's changes may be carried out at a more leisurely pace and used to modify and refine the operations of the system 200 to give

better performance in response to later requests for assistance in filling out this and other forms. This can, if necessary or desirable, be carried out as a "background" activity or one interruptible by the more time critical tasks carried out by the match engine 500 while the user is waiting to view a form.

[00077] The completed form analysis engine 800 first determines what type of processing, if any, this completed form received from the match engine 500 before it was returned to the user's browser 108 or 114.

[00078] If this is the first time that this particular form had ever been encountered, and if the match engine returned it to the user's browser 108 or 114 with nothing filled in, then the completed form analysis engine 800 simply saves the form in the history database 1200 by calling upon a save in history database program 900 to carry out the following steps: First, the web address of the form is determined. Second, the field labels within the form are retrieved and identified. Third, the data entered by the user opposite each field label is looked up in the user's wallet database 1100; and if a match can be found, then the actual literal information (name, address, etc.) is removed and is replaced by the wallet database's non-personal identifier or symbolic name for that particular literal data element. For example, "Jack" would be replaced by '<FirstName>'. In this manner, the form is reduced to the form shown at 1202 in Figure 12 and is passed on to the history unit 230 for storage in the history database 1200. In this manner, there is no personal information related to wallet database information kept in the history database 1200, but only the wallet database non-personal identifiers or symbolic names for personal information that is stored in the wallet.

[00079] If a given form had been encountered before, and if the match engine relied upon the history unit 230 to complete the form for this user, then the completed form analysis engine 800 proceeds as just described to save the form in the history database 1200, but now the history database 1200 contains two or more copies of this particular form. The completed form analysis engine 800 then calls upon a history form compare system 233 to compare the multiple copies of the form within the history database 1200 to see if the versions filled in by different users match. If at least two copies of the form are present, and if the two or more versions of the form in the history database match, both as to the field labels and sizes and as to the personal information non-personal identifiers or symbolic names that are associated with those field labels, then the assumption is made that the forms have been correctly analyzed. The history form compare system 233 then generates a new set of rules for this particular form using a new rule generator 234 which places the new rules into the dictionary 1000, feeding them over the path 236. The history form compare system 233 then sends an